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ABSTRACT

This document contains hands-on activities in science that make use of balloons and are fun and stimulating as well as challenging. By actively participating in these activities, students can develop science process and critical thinking skills as well as technical and measuring skills. Topics include Air as Matter, Pressure, Chemical Change, Density, Electrostatic Force, and Electron Location. (JRH)

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FUN WITH HANDS-ON SCIENCE ACTIVITIES

FOR ELEMENTARY TEACHERS*

PRESENTED BY

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AGENDA

- **Brief Introduction for Hands-On Learning in Science**
- **Hands-On Lab Activities and Demonstrations for a Variety of Science Areas**
- **Complementary Resources for Hands-On Science**
  - **Science Education Music Cassette *CHEMICAL SENSATION WITH THE BARRY TONES***
  - **Video Segments Exemplifying Hands-On Science from the TV Show *SENSATIONAL SCIENCE WITH DR. DANA BARRY***
  - **Books and Handouts**

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INTRODUCTION

To ensure well run classes and student learning, students must be motivated in a way that is favorable toward learning. Teachers should strive to prepare a pleasant environment for learning, be knowledgeable and interested in the subject matter, obtain student interest, know and care for the students, and provide for individual differences by using a variety of activities and materials. Active student participation in activities is of great importance. For example, reading and listening to lectures about the game of baseball and its rules alone does not make one a baseball player. To become a baseball player, one also needs to develop the fundamental skills of the game. These skills include catching, throwing, batting and running. Skill development is accomplished when one actively participates in activities involving the skill. Perfection and maintenance of a skill are obtained when one properly practices the skill frequently. By actively participating in science activities, students develop science process and critical thinking skills as well as technical and measuring skills and more. Hands-on activities in science can be fun and stimulating as well as challenging. The following are hands-on science activities that make use of balloons.

SCIENCE FUN WITH BALLOONS

by

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Balloons come in different sizes, shapes and colors. They represent fun to children and are used at parties and celebrations. Why not take advantage of students' interest in balloons and use them to provide challenging and exciting hands on activities in science. Balloons can be easily used to demonstrate concrete examples of science concepts. The following activities use balloons for demonstrations and laboratory activities in various areas of the science curriculum.

Science Area: Air as Matter

Matter is anything that has mass and takes up space. It may be in solid, liquid, or gas form. Air, a mixture of gases that surrounds us, is mainly composed of nitrogen and oxygen. Students can't see air and sometimes don't realize that it takes up space. The following activity exemplifies this and may be done as a teacher demonstration or by each student.

Materials: plastic beaker-200ml
balloon

Have each student hold a deflated balloon in the beaker and then blow it up. Ask the students if the balloon fills up the beaker and why. The students should see that the balloon does not fill up the beaker because the beaker contains air and air takes up space.

Science Area: Pressure

Pressure is a force per unit area or a weight per unit of area. For example, a book with a weight of 10 newtons (4.45 newtons equal 1 pound) and a back cover area of 100 square centimeters is resting on a table. The force of 10 newtons is evenly spread over the area of 100 square centimeters. The pressure exerted by the book on the table is

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$\text{pressure} = \frac{10 \text{ newtons}}{100 \text{ cm}^2} = \frac{0.1 \text{ newtons}}{\text{cm}^2}$$

Air exerts pressure, although many of us are not aware of it. This is because air pressure is exerted in all directions, both inside and outside our body.

To exemplify air pressure, the teacher may heat up an empty soda can containing a small amount of water. The heat pushes the air out of the can and the can is easily crushed by the unbalanced outside air pressure.

The following activity has students compare the pressure on gas particles in a small balloon with those in a large balloon.

Materials: balloons of the same size (2)
size 3 rubber stopper with a hole in it (1)

Students may work in pairs for this activity. If they have difficulties with it, then the teacher should do it as a demonstration with students as assistants. Have one student of each pair hold the stopper and the other student blow up the 2 balloons. Have the student blow one balloon up two-thirds of the way, twist it so the gas doesn't come out and then carefully place it over one end of the stopper. Then have the student blow the other balloon one-third of the way, twist it so the gas doesn't come out and then carefully place it over the other end of the stopper. Finally have the student carefully untwist the balloons so that the gas moves through the stopper.

Have the students determine what will happen. Will the gas from the larger balloon go into the smaller balloon or will the gas from the smaller balloon go into the larger balloon and why? If the reaction is slow, have the students take turns squeezing the large and small balloons. (The gas particles in the smaller balloon have more pressure on them and therefore they will move into the larger balloon).

Science Area: Chemical Change

A chemical change happens in a reaction when one or more new substances are formed with new properties. Observations indicating a chemical change include the formation of a precipitate or solid when two clear solutions are mixed or a color change. Also signs of chemical change include the evolution of a gas (indicated by bubbles) and a temperature change in the reaction mixture not caused by external heating or cooling.

Have the students work in pairs to do the following activity on detecting chemical change.

Materials: plastic juice bottle with a narrow top
baking soda
vinegar
teaspoon
balloon
ruler

Have the students pour vinegar into the empty juice bottle so that the bottle contains about one inch of vinegar. Next have the students put a heaping teaspoon of baking soda into the deflated balloon. Finally have the students place the balloon (containing the baking soda) over the bottle top. Tell the students to note what happens and why. (The baking soda and vinegar combine to form the gas carbon dioxide. The gas blows up the balloon).

Science Area: Density

Density is the mass per unit volume. It is usually expressed as grams per cubic centimeter for solids and liquids and usually as grams per liter for gases. Carbon dioxide gas is more dense than air. Blow up a balloon, tie and toss it in front of the class. The blown balloon will remain on the floor because it contains carbon dioxide which is more dense than air. (Remind students that we breathe in oxygen and exhale carbon dioxide).

The following activity allows students to determine the density of water using balloons.

Materials: balance
balloon
water
graduated cylinder - 10ml

Have students work in pairs. Each pair should weigh a balloon to the nearest tenth of a gram. Using the graduated cylinder have the students carefully pour 10ml of water into the balloon and tie it. Next have the students reweigh the balloon to the nearest tenth of a gram.

Have the students determine the mass of the water by subtracting the mass of the balloon with-out water from the mass of the balloon containing water.

The Density of water equals the mass of the water (found above) divided by the volume (10ml).

$D = \frac{m}{v}$ D= density, m= mass, v= volume (1ml= $1cm^3$)

The true density of water is 1. Have students compare their values with the true value by calculating percentage error. The percentage error is the positive difference between the accepted value and the student value divided by the accepted value and multiplied by 100.

$$\% \text{ Error} = \frac{\text{positive difference}}{\text{accepted value}} \times 100$$

Science Area: Electrostatic Force

Bodies with like charges repel each other and those with opposite charges attract each other. This force of attraction or repulsion is called an electrostatic force. One can demonstrate this force with 2 magnets. Hold 2 magnets so that the like poles (the same charge) are near each other. They repel each other. Next hold the magnet so that opposite poles are near each other. They attract each other.

Have the students do the following activity to study electrostatic force. They may work in pairs.

Materials: rope or rod
string
balloons of the same size (2)
hair

Have each pair of students blow up the two balloons and tie them. Then have the students tie a string or thread (about 2 feet long) to each balloon and tie them to a suspended rope or rod so that the balloons are next to each other and can swing freely.

Next have a student rub one of the balloons on his/her hair and release the balloon. What happens? Why? Now have the students rub both balloons on their hair and release them. What happens? Why?

When one balloon is rubbed on the hair it becomes charged and is attracted to the other balloon. When both balloons are rubbed on the hair and released the balloons repel each other. (Like charges repel and unlike charges attract).

Science Area: Electron Location

Students use electricity every day. They use it when they listen to the radio, watch television and so on. Electricity is a flow of electrons. An electron is a negatively charged particle that is part of an atom. (An atom is the smallest part of an element that can undergo chemical change). Electrons are thought to be located in electron clouds outside the center of the atom. Within these clouds ,

electrons are thought to be located in orbitals within sublevels of principal energy levels. Let's illustrate electron location with people staying in a hotel. The hotel will represent the electron cloud and the people will represent the electrons. One can locate the electron pair, Mr. and Mrs. Smith , in the following way. Mr. and Mrs. Smith are on the second floor in room 208 sitting on a love seat. The second floor represents the second principal energy level, the room 208 represents the sublevel within the principal energy level and the love seat represents the orbital within the sublevel. (Inform the students that each orbital holds 2 elactrons).

The following activity on electron location may be done as a teacher demonstration or by students working in pairs.

Materials: pairs of balloons of the same size (3)
each above pair a different color
one other balloon- the same size as the above but a different color
string
wire ties

Students will use balloons to prepare a three dimensional model of electron location as shown in Figure 1. Electrons in the S sublevel have a spherical shape as seen in the one balloon (Figure 1). Electrons in the P sublevel have a figure eight shape and can be found in an X,Y, or Z axis location (Figure 1). Each colored pair of balloons represents an axis.

EXTENDED ACTIVITIES

Balloon Travel

Students will determine the distance and time for a balloon to travel. Have each student launch a balloon containing helium. First cut 3x5 cards in half and pass them out to the students. Have the students write the following information on the cards: Date Launched, Student Name and Address, Student Phone Number, and a statement saying that if found please call or return to student. For protection have the student place a plastic bag over the card before attaching it to the balloon. Finally have the students launch the balloons. Discuss the balloon launch results in class - include miles balloons traveled and time required for balloons to travel.

Balloon Research

Have students do research on balloons. You may have students work in groups for this project. Each group should investigate one of the following:

- Definition of Balloon
- First Balloon Flights
- Gases Used in Balloon Flights and Why
- Balloon Uses (ex. Sports, Military and Meteorlogical use)

Students may share information by giving oral presentations, drawing pictures and diagrams and by doing demonstrations.

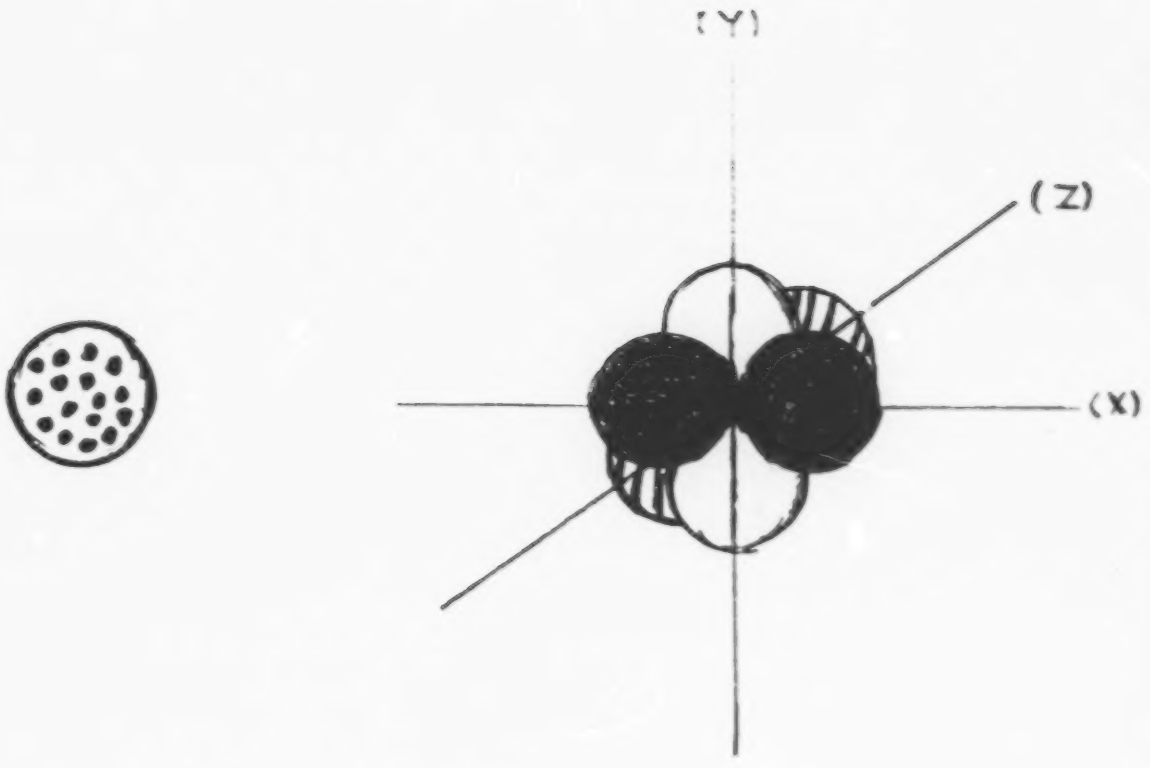

FIGURE 1.

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